



**ZEBRA**

Zebra Technologies  
Enterprise Corporation  
3 Overlook Point  
Lincolnshire, IL 60069

p 847-634-6700  
f 847-913-8766  
zebra.com

**VIA ELECTRONIC FILING**

Ms. Marlene H. Dortch, Secretary  
Federal Communications Commission  
445 Twelfth Street, SW  
Washington, DC 20554

**Re: Ex Parte Communication**, Notice of Inquiry on Expanding  
Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz.  
GN Docket No. 17-183

Dear Ms. Dortch:

We understand there are ongoing negotiations between RLAN representatives and Fixed Wireless Communications Coalition (FWCC)<sup>1</sup> to determine if there is viable solution that will protect incumbent licensed users from interference caused by unlicensed RLAN (Wi-Fi) in the 6 GHz band. To date, Zebra Technologies and other companies deploying Ultra-Wideband (UWB) technologies in the 6 GHz band have not been an active participant in those negotiations. However, we have been following the proposals closely and evaluating the impact on Zebra's UWB technologies. The purpose of this letter is to present a coexistence solution that would work to protect incumbent licensed users and allow for unlicensed UWB and RLAN users to coexist.

The FCC has a mandate to foster the development of innovative uses of spectrum for maximum public good. We believe UWB solutions certainly have demonstrated such innovation and benefits to society. Across the UWB industry, solutions have been built to track worker safety at manufacturing facilities, enhance worker productivity, and track people and materials at US port of entry checkpoints by the TSA. As we noted in our reply comment<sup>2</sup>, Zebra Technologies currently produces and deploys UWB real-time locating systems (RTLS) for a variety of applications, including safety, logistics and manufacturing.

Zebra's Dart RTLS transmitters are certified under FCC Part 15.250, which was created in 2005 by FCC Second Report & Order (See ET Docket 98-153). This Order was the culmination of several years of proceedings, beginning with the NOI of September 1, 1998, and ending with the Third Memorandum Opinion and Order on August 11, 2010, in which the established limits were upheld. Part 15.250 pertains to the same 5.925-7.125 GHz spectrum which is currently the subject of the NOI of GN Docket 17-183. In the heated debate leading up to the First Report and Order of April 22, 2002, Zebra (then as Multispectral Solutions)

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<sup>1</sup> Comments of Fixed Wireless Communications Coalition, GN Docket No. 17-183 (filed August 28, 2018)

<sup>2</sup> Comments of Zebra Technologies, GN Docket No. 17-183 (filed November 3, 2017)

was a proponent of a spectrally responsible approach which would protect incumbent services.

Due to the strict requirements of 15.250 and Part 15 Subpart F, spectrum sharing has been practiced very successfully by Zebra and others. Recent years have seen the advancement of commercially available UWB integrated circuits (ICs, or “chips”) allowing for widespread utilization of 5925-7250 by many companies with innovative applications. The extremely low spectral density requirements of Part 15 (-41.25dBm/MHz), and the wide bandwidths, allow UWB to utilize time-of-flight information to provide unique functionality without detectable interference to licensed Fixed Microwave Service (FS) incumbents.

It is important to note that many UWB deployments are large, utilizing multiple receivers and involve heavy investment. These are not consumer-oriented deployments. Rather, these deployments are in industrial settings such as assembly plants and refineries. UWB is utilized for various productivity enhancements including tracking products such as automobiles through the assembly process, and locating of high-value tools and equipment. There are also deployments which enhance safety procedures for workers. The existing and potential benefits of these applications are wide-ranging. The uncertainty introduced by the potential for unmitigated, and unpredictable, RLAN deployments will discourage investment in UWB systems and preclude the associated benefits.

The spectral densities requested for a new RLAN allocation are about 40-50dB above those currently allowed<sup>3</sup> for unlicensed use. We believe this large departure from previous regulatory limits warrants further discussion about effective spectrum utilization. In fact, as recently as 2014, the FCC showed extreme caution by only allowing an increase of 8dB (7dB peak) in allowed spectral density for Level Probing Radars (LPRs) with the creation of Part 15.256. At that point, the Commission was specifically intending to avoid “the establishment of a local area network of transmitters”<sup>4</sup> while reaffirming its position to avoid fixed outdoor infrastructure as per 15.250. With such a precedent, and considering the unique functionality made available by UWB innovations, a coexistence strategy is essential in order to utilize the spectrum for maximum public benefit.

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<sup>3</sup> See Comments of Wi-Fi Alliance (filed Aug 8, 2018), Apple, Broadcom, et al (filed May 14, 2018), and others.

<sup>4</sup> R&O FCC 14-2 and 79 FR 12670

Zebra restates our commitment to working cooperatively to explore all possible options that may make more effective use of the limited, and shared, resource of radio bandwidth. Zebra routinely works with coordinators, examines Universal Licensing Systems, and performs on-site surveys to assess the RF environment at each installation. Receivers with custom filters and diversity have been developed and deployed to accommodate both fixed and mobile incumbents. To date, it is precisely because of the spatial and spectral predictability of these bands that Zebra is able to coexist.

While Zebra continues to advocate for no new RLAN allocation in 5925-7125, we also recognize that some change may be inevitable. After reviewing the proposals being offered by the RLAN proponents and the FWCC responses, we offer the following proposal that protects incumbent licensed users, and allows for coexistence of UWB and RLAN. Understanding the enormity of the spectral density requested, the following outlines the three components that, together, comprise a mitigation solution which would allow for more flexible use and provide benefits to existing and new unlicensed users while protecting incumbents.

#### **Indoor Only, Prohibit Mobile APs**

Part 15 Subpart F restricts some UWB operations between 3.1 and 10.6 GHz to indoor operation to mitigate interference. Similarly, 15.250 prohibits fixed infrastructure outdoors between 5925 and 7250MHz. Zebra suggests that the Commission apply a similar restriction to mid-band RLAN use. Since enforcement of such a restriction would be unlikely, and the risk of causing interference at the power levels being requested would be quite high in 5925-7125, this form of mitigation by itself is not sufficient. However, it would add a substantial amount of attenuation in most cases and most likely put distance between an UWB deployment and an RLAN AP to prevent some interference. This requirement will help mitigate interference to FS receivers as well. FS, as a licensed service, has the right to seek long-term mitigation if an indoor AP was found to degrade a link. A further requirement should be to prohibit mobile operation of an AP. Due to the dynamic and unpredictable nature of mobile devices, a mobile AP, even if operated indoors, could wreak havoc on an FS link without any traceability to allow for effective long-term mitigation. This requirement would have the added benefit of preventing random interference to stationary UWB deployments.

#### **Reduced Power**

Several of the comments submitted have assumed significant power levels (> +30dBm = 1W) for unlicensed RLAN Access Points (APs). The potential range for interference to an industrial UWB installation at this power level extends to several thousand feet, which is well beyond the controllable perimeter of the

installation. To greatly reduce the potential for interference, the Commission should restrict power levels for RLAN APs to +17dBm (50mW) or even +10dBm (10mW). These power levels will still allow for many RLAN applications and furthermore will encourage optimal receiver design. Together with an indoor restriction, this should reduce the interference range down to a few hundred feet, which is often within the controllable perimeter of UWB installations.

### **Geographic Exclusion**

Many UWB deployments are in industrial settings and involve dozens of interconnected receivers. The significant increase in spectral density requested by the RLAN community will cause interference with UWB deployments. In some cases, the controllable perimeter is insufficient for mitigation by range alone. For such substantial deployments, the performance of UWB could easily be compromised by the presence of an RLAN AP near the perimeter. In order to gain the benefits made available from UWB, it would be necessary to exclude 6 GHz RLAN operation within a region surrounding the deployment perimeter. For this reason, it is requested that the Commission allow UWB deployments to participate in an exclusion zone database, such as the one being proposed to mitigate interference to FS licensees. Industrial users of UWB could tolerate a registration process, similar to that employed for whitespace wireless microphones (15.711, 15.713), in order to gain assurance that their location systems would continue to function.

Based on our experience deploying UWB technologies in the 6 GHz band while successfully coexisting with incumbent licensed users, we believe our suggested three-pronged mitigation solution allows for more flexible use in the 6 GHz band. This mitigation solution will protect incumbent users, allows UWB to continue to deploy and invest, and paves the way for new unlicensed RLAN uses.

To conclude, we understand and appreciate the Commission's interest in allowing for more flexible use in the 6 GHz band. At the same time, we urge the FCC and other stakeholders to recognize that current unlicensed UWB technologies already successfully coexist with incumbent users in the 6 GHz band and provide valuable functionality. We hope that we can collectively work to develop a solution that allows UWB to coexist with RLAN uses.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "C S Mower".

Carl S. Mower, Head of Engineering,  
Location Solutions, Zebra Technologies